IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

VUORINEN et al Atty. Ref.: **30-497**

Serial No. **09/262,912** Group: **1731**

Filed: **March 5, 1999** Examiner: **Hug**

For: **METHOD OF TREATING CHEMICAL CELLULOSE PULP**

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May 8, 2006

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

Applicant hereby appeals the Examiner's rejection of claims 21-22, 25, 27-29, 32-35 and 37-41[1] in the Official Action dated January 3, 2006. As will become evident from the following discussion, the Examiner's art-based rejections are in error and, as such, reversal of the same is solicited.

I. REAL PARTY IN INTEREST

The real party in interest is the assignee of the subject application, Andritz Oy (formerly Andritz-Ahlstrohm Oy).

II. RELATED APPEALS AND INTERFERENCES

There are no appeals and/or interferences related to the subject application.

[1] The appealed claims are set forth in the Appendix hereto.

III. STATUS OF CLAIMS

The following represents the status of the claims pending herein:

A. The following claims are presently pending in this application: 21-22, 25, 27-29, 32-35 and 37-41.

B. The following claims have been allowed: None.

C. The following claims have been cancelled: 1-20, 23-24, 26, 30-31 and 36.

D. The following claims are the subject of this appeal: 21-22, 25, 27-29, 32-35 and 37-41.

IV. STATUS OF AMENDMENTS

An amendment under 37 CFR §116 has been filed subsequent to the January 3, 2006 Official Action, but prior to the filing of a Notice of Appeal pursuant to 37 CFR §41.37. The Rule 116 amendment was filed so as to correct a minor typographical error which was recently noticed in claim 35 (i.e., so as to change the incorrect expression "1000C" to the correct expression "100^0C"). Since the proffered amendment merely corrects a typographical error present in a pending claim and thus presents such claim in better form for appeal, its entry for the purpose of this Brief has been assumed.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Each of the applicants' independent claims pending herein is directed to a method of treating chemical alkaline pulping process, after cooking and preferably after oxygen delignification, with ClO_2 in a first chlorine dioxide stage of an elemental chlorine free bleaching sequence and of minimizing the use of ClO_2 which ***consists of*** the sequential steps of (a) bleaching in a first ClO_2 step at conditions recited in the claim, (b) effecting an acid treatment of the pulp for step (a) under conditions recited in the

claim, and (c) bleaching the pulp from step (b) in a second ClO_2 step. [Page 2, line 26 bridging page 3, line 9.]

More specifically, according to independent claim 21, a method of treating chemical cellulose pulp from an alkaline pulping process is provided wherein, after cooking and preferably after oxygen delignification, with chlorine dioxide in a first chlorine dioxide stage of an elemental chlorine free bleaching sequence, and of minimizing the use of chlorine dioxide, consisting of the sequential steps:

(a) bleaching the chemical cellulose pulp in a first chlorine dioxide step at a temperature between 80-100^{0}C for less than 10 minutes and so as to provide a chlorine dioxide dosage of between 0.5-1.5 % active chlorine, and adjusting the pH of the pulp in the first chlorine dioxide step so that the final pH of the step is over 4;

(b) effecting an acid treatment of the chemical cellulose pulp from step (a) at a pH of between 2 – 5 and at a temperature of over 80°C and a time of 30-300 minutes sufficient to remove hexenuronic acids from the pulp, and

(c) bleaching the chemical cellulose pulp from step (b) in a second chlorine dioxide step. [Page 4, line 3 through page 5, line 12, Figure 1 and its accompanying description on page 8, line 19 through page 10, line 20 and the Example on page 10, line 25 through page 12, line 15.]

According to independent claim 35, a method of treating chemical cellulose pulp from an alkaline pulping process is provided wherein, after cooking and preferably after oxygen delignification, with chlorine dioxide in a first chlorine dioxide stage of an elemental chlorine free bleaching sequence, and of minimizing the use of chlorine dioxide, consisting of the sequential steps:

(a) bleaching the chemical cellulose pulp in a first chlorine dioxide step so that the final pH of the step is over 5, and so as to provide a chlorine dioxide dosage of between about 0.5-1.5 % active chlorine and so that hexenuronic acid groups in the pulp substantially do not react with chlorine dioxide, and for a treatment time of between 30 seconds-three minutes and at a temperature of 80-100^{0}C;

(b) acid treating the chemical cellulose pulp from step (a) at a pH of between 2 - 5 and at a temperature of over 80°C for 30-300 minutes, and

(c) bleaching the chemical cellulose pulp from step (b) in a second chlorine dioxide step. [Page 4, line 3 through page 5, line 12, Figure 1 and its accompanying description on page 8, line 19 through page 10, line 20 and the Example on page 10, line 25 through page 12, line 15.]

According to independent claim 39, a method of treating chemical cellulose pulp from an alkaline pulping process is provided wherein, after cooking and preferably after oxygen delignification, with chlorine dioxide in a first chlorine dioxide stage of an elemental chlorine free bleaching sequence, consisting of the sequential steps:

(a) bleaching the chemical cellulose pulp in a first chlorine dioxide step at a chlorine dioxide dosage of between about 0.1-1.0% active chlorine and at a temperature of between 80-100^{0}C and for less than 10 minutes, and adjusting the pH of the pulp in the first chlorine dioxide step so that the final pH of the step is over 4,

(b) acid treating the chemical cellulose pulp from step (a) at a pH of between 2 – 5 and at a temperature of over 80°C for 30-300 minutes, and

(c) bleaching the chemical cellulose pulp from step (b) in a second chlorine dioxide step at a chlorine dioxide dosage of between about

0.5-2.0% active chlorine. [Page 4, line 3 through page 5, line 12, Figure 1 and its accompanying description on page 8, line 19 through page 10, line 20 and the Example on page 10, line 25 through page 12, line 15.]

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following issue is presented for purpose of this appeal:

> Has the Examiner erroneously rejected claims 21-22, 25, 27-29, 32-35 and 37-41 pending in this application under 35 USC §103(a) as allegedly obvious, and hence unpatentable, over Henricson (WO 97/15713) in view of Chang et al (WO 91/05909.

VII. ARGUMENT

The Board will observe that Henricson primarily relates to an acid treatment of pulp at high temperature in connection with bleaching and discloses *inter alia* that the acid stage can be combined with a chlorine dioxide stage. (See claim 3) ON page 7 of Henricson, bleaching sequences containing AD- and DA-treatment steps in that order are described. Henricson further emphasizes advantages (no need to wash off hexenuronic acids from the pulp before the bleach treatment) if an acid treatment (A) is followed by a bleaching stage such as a chlorine dioxide stage (D). ON the other hand, Henricson is silent as to the particular technical effects achieved by the DA-treatment sequence and, furthermore, does not specify at all any suitable process conditions for the D-stage if this DA-treatment sequence is adopted.

For the reasons noted above, at least the following process conditions of the D-stage establish clear differences between the present invention and Henricson:

- a temperature of 80 – 100^{0}C;
- a treatment time less than 10 minutes;
- a chlorine dioxide dosage of 0.1 to 1.5% active chlorine;
- a pH valued (final pH) of over 4; and
- a second D step.

These essential features of the present invention are not suggested at all by Henricson. Nor does Chang et al cure the deficiencies in Henricson.

In this regard, the Examiner asserts that Chang et al teach addition of acid after chlorine dioxide treatment or split addition of chlorine dioxide. The Examiner further alleges that the ordinarily skilled person would combine addition before chlorine dioxide addition, acid addition after chlorine addition, and split chlorine dioxide addition to arrive at the herein claimed DAD sequence.

In this regard, as applicants have reiterated during prosecution to date, Chang et al teach (see page 3, line 18 – page 4, line 13; 8, line 23- page 9, line 15) a two-step (high/low pH) chlorine dioxide bleaching process, consisting of the following steps:

- adding chlorine dioxide to a wood pulp suspension and subjecting the pulp suspension to a first treatment step for about 5 to 40 minutes so that the pH is between 6.0 and 7.5; and
- acidifying the suspension and subjecting the mixture to a second treatment step for about 2 or more hours so that the pH at the end of the second step is between 1.9 and 4.2.

There is no additional step after the acidification according to Chang et al, in which ClO_2 would be added to the pulp. In the claims of Chang et al (page 29), a method is provided in which the charge of chlorine dioxide is split between the first and second steps. The first portion is added so that the end pH of the first step is 6-12, and

after that the remaining portion is added and the end pH is 1.9-4.2. It must be noted that the pulp is ***not*** subjected to any separate acid step between the ClO_2 additions. Accordingly, Chang teaches a bleaching stage which consists of a first D step and a second D step.

In other words, Change et al discloses a D stage, in which the pH is first maintained at a high level for a short time and then at a conventional value (3.8) for a conventional time (3 hours). Correspondingly, the acidification necessary for the second step is an essential part of such D-stage. The D stage of Change et al is therefore more accurately described in terms of the common symbol D_A. This can also be derived from the higher amounts of chlorine dioxide used according to Change et al which leads to substantial amounts of chlorine dioxide during the second stage. (The dosages of chloride dioxide taught by Chang et al are not given for an elemental chlorine free bleaching sequence, and thus not for the first D stage of such sequence, as applicants claim. In the examples of Change et al, the pulp is treated in a CD (chlorination) stage before the claimed D stage. No mention of oxygen delignification can be found in Change et al.) The split addition of chlorine dioxide confirms this interpretation. Chang et al clearly disclose that either acid or additional chlorine dioxide is added after the first step. So the final pH value of 1.9-4.2 (preferably 3.8) is accomplished either by adding acid or chlorine dioxide.

Thus, Change et al does not teach or suggest a manner in which the process of Henricson may be modified so as to result in the applicants' claimed processes.

Applicants further note that the ordinarily skilled person would not in the first instance consider combining Henricson and Chang et al. IN this regard, since Change et al does not disclose a mere D- or A-step, but instead discloses at most what could be called a D_A-stage, the information disclosed in Change et al for such D_A-stage is meaningless for optimizing the D- or A-steps of the present invention. Specifically,

- The two D-steps (split addition) disclosed in Change et al would be regarded by a skilled person as one continuous chlorine dioxide stage, where the second part is typically performed at a pH of below 4, optimally at a pH of 3.8. this teaching does not influence the ordinarily skilled person to use a final pH of above 4 as defined in the applicants' claims.

- The purpose of the A stage of the present invention as defined in the pending claims is the removal of hexenuronic acids whereby the entire process is simplified and a final D-step can be prepared. It should be noted that the effect of hexenuronic acids is not discussed in Chang et al, which represents a further reason why Henricson and Chang et al do not render obvious the herein claimed invention.

In conclusion, the Examiner's art-based rejections of the claims pending herein are in error and must be reversed as being inapposite to the proper standards for reviewing patentability under 35 USC §103(a). Such a decision is therefore solicited.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

21. A method of treating chemical cellulose pulp from an alkaline pulping process, after cooking and preferably after oxygen delignification, with chlorine dioxide in a first chlorine dioxide stage of an elemental chlorine free bleaching sequence, and of minimizing the use of chlorine dioxide, consisting of the sequential steps:

(a) bleaching the chemical cellulose pulp in a first chlorine dioxide step at a temperature between 80-100^{0}C for less than 10 minutes and so as to provide a chlorine dioxide dosage of between 0.5-1.5 % active chlorine, and adjusting the pH of the pulp in the first chlorine dioxide step so that the final pH of the step is over 4;

(b) effecting an acid treatment of the chemical cellulose pulp from step (a) at a pH of between 2 – 5 and at a temperature of over 80°C and a time of 30-300 minutes sufficient to remove hexenuronic acids from the pulp, and

(c) bleaching the chemical cellulose pulp from step (b) in a second chlorine dioxide step.

22. A method as recited in claim 21 wherein (a) is practiced so that the final pH of the first chlorine dioxide step is over 5, and so that hexenuronic acid groups in the pulp substantially do not react with chlorine dioxide.

25. A method as recited in claim 22 wherein step (a) is further practiced so that the treatment time in the first chlorine dioxide step is between 30 seconds - 3 minutes.

27. A method as recited in claim 21 wherein (a)-(c) are practiced so that the treatment temperatures in the first chlorine dioxide step, the acid treating step, and the second chlorine dioxide step, are substantially the same.

28. A method as recited in claim 21 wherein (c) is practiced so as to provide a chlorine dioxide dosage of between about 0.5-2.0% active chlorine during the practice of the second chlorine dioxide step.

29. A method as recited in claim 21 further consisting of treating the chemical cellulose pulp with a chelating agent after (a) and (b).

32. A method as recited in claim 21 wherein (a) is further practiced so that the treatment time in the first chlorine dioxide step is between 30 seconds - 3 minutes, and at a chlorine dioxide dosage of about 0.1-1.0% active chlorine.

33. A method as recited in claim 21 wherein step (b) is practiced at a pH between 2.5-4, a temperature between 90-110°C, and a time between 30-300 minutes.

34. A method as recited in claim 21 wherein (a) through (c) are practiced utilizing an acid tower, an inlet line to the acid tower, and an outlet line from the acid tower to a further treatment device; and wherein (a) is practiced substantially completely within the inlet line to the acid tower, (b) is practiced substantially completely within the acid tower, and (c) is practiced substantially completely in the discharge line from the acid tower.

35. A method of treating chemical cellulose pulp from an alkaline pulping process, after cooking and preferably after oxygen delignification, with chlorine dioxide in a first chlorine dioxide stage of an elemental chlorine free bleaching sequence, and of minimizing the use of chlorine dioxide, consisting of the sequential steps:

(a) bleaching the chemical cellulose pulp in a first chlorine dioxide step so that the final pH of the step is over 5, and so as to provide a chlorine dioxide dosage of between about 0.5-1.5 % active chlorine and so that hexenuronic acid groups in the pulp substantially do not react with chlorine dioxide, and for a treatment time of between 30 seconds-three minutes and at a temperature of 80-100^{0}C;

(b) acid treating the chemical cellulose pulp from step (a) at a pH of between 2 - 5 and at a temperature of over 80°C for 30-300 minutes, and

(c) bleaching the chemical cellulose pulp from step (b) in a second chlorine dioxide step.

37. A method as recited in claim 35 wherein (a)-(c) are practiced so that the treatment temperatures in the first chlorine dioxide step, the acid treating step, and the second chlorine dioxide step, are substantially the same.

38. A method as recited in claim 35 wherein (a)-(c) are practiced so that the treatment temperatures in the first chlorine dioxide step, the acid treating step, and the second chlorine dioxide step, are substantially the same, and between about 90-100°C.

39. A method of treating chemical cellulose pulp from an alkaline pulping process, after cooking and preferably after oxygen delignification, with chlorine dioxide in a first chlorine dioxide stage of an elemental chlorine free bleaching sequence, consisting of the sequential steps:

(a) bleaching the chemical cellulose pulp in a first chlorine dioxide step at a chlorine dioxide dosage of between about 0.1-1.0% active chlorine and at a temperature of between 80-100^{0}C and for less than 10 minutes, and adjusting the pH of the pulp in the first chlorine dioxide step so that the final pH of the step is over 4,

(b) acid treating the chemical cellulose pulp from step (a) at a pH of between 2 – 5 and at a temperature of over 80°C for 30-300 minutes, and

(c) bleaching the chemical cellulose pulp from step (b) in a second chlorine dioxide step at a chlorine dioxide dosage of between about 0.5-2.0% active chlorine.

40. A method as recited in claim 39 wherein (a) is further practiced so that the temperature in the first chlorine dioxide step is between about 80-100°C, and so that the treatment time in the first chlorine dioxide step is between 30 seconds – three minutes.

41. A method as in claim 39, wherein step (c) is practiced for less than 10 minutes.

IX. EVIDENCE APPENDIX

[NONE]